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**BALLOON OCCLUSION THERAPY FOR PLACENTA PREVIA BLEEDING:A
LITERATURE REVIEW****Qanita Saifana , Rahma Soraya Wijanarko**

Faculty of Medicine, YARSI University, DKI Jakarta, Indonesia

Email: qanita.saifana@students.yarsi.ac.id

Abstract

Placenta previa (PP) is a condition where the placenta abnormally implants in the lower uterine segment, with complete coverage of the internal cervical os termed as complete placenta previa (CPP). Often associated with placental adhesion and abnormal placentation, known as placenta accreta, it poses a risk of massive peripartum bleeding, increasing the likelihood of requiring blood transfusions, and contributing to maternal morbidity and mortality. PP cases currently affect 0.56% of women. The risk of hysterectomy post-cesarean delivery in PP is 3.5%, significantly higher than in mothers without PP. The surge in cesarean deliveries for PP substantially impacts gynecological medical care costs. PP has various risk factors, including maternal age, abortion history, uterine myoma, high body mass index, high baby weight, male fetus, maternal tobacco use, and a prior cesarean section. Placental adhesions, such as accreta, percreta, or increta, further complicate the condition, with a prevalence of 0.3-2% in the third trimester, often requiring blood transfusions. Surgical methods, like ligation of uterine arteries, floseal usage, uterine compression sutures, and hemostatic sutures, aim to restore placental homeostasis, with hysterectomy considered if bleeding persists. Balloon occlusion, employed since the 1980s, has shown promise in reducing bleeding during cesarean operations for PP by stopping blood flow to the targeted area, specifically the internal iliac artery. The procedure involves inflating a balloon with saline, compressing the artery wall to achieve hemostasis. Despite its potential benefits, balloon occlusion carries possible side effects and complications, including arterial injury, infection, uncontrolled bleeding, ischemia, and allergic reactions. Conservative therapy in PP includes close monitoring, bed rest, and blood transfusions if necessary, while surgical interventions like uterine artery embolization and hysterectomy are considered. However, surgical therapies present risks and potential impacts on future pregnancies. Balloon occlusion's application requires careful consideration of diagnosis accuracy, placental invasion degree assessment, and skilled medical personnel. The procedure's benefits and risks must be thoroughly evaluated, and patients should be informed comprehensively before consenting to the treatment. While studies suggest its effectiveness in reducing PP bleeding and minimizing complications, further research, particularly large-scale randomized controlled clinical trials, is essential to validate its widespread effectiveness, understand influencing variables, and assess its mechanism of action in-depth. Such research will contribute to refining balloon occlusion's usage for improved outcomes in PP cases.

Keywords: *Placenta previa, Balloon occlusion, Cesarean delivery.*

INTRODUCTION

Placenta previa (PP) is defined as abnormal implantation of the placenta in the lower uterine segment (Vabret et al., 2020). The condition in which the placenta completely covers the internal cervical os, is

called complete placenta previa (CPP) (Lal & Hibbard, 2015). PP is sometimes combined with placental adhesion and abnormal placentation, referred to as placenta accreta, which includes accreta, increta, and percreta. This condition can cause massive peripartum bleeding, which increases the chance of needing a blood transfusion. Thus, PP is associated with maternal morbidity and mortality (Say et al., 2014).

Cases of women diagnosed with PP currently reach 0.56% (Jauniaux, Khatibi, Rainville, & Jackson, 2019). In PP cases, the risk of hysterectomy after cesarean delivery is 3.5%, higher compared to mothers without PP. The increasing rate of cesarean delivery due to PP has a major impact on the costs of gynecological medical care (Wang et al., 2020). PP has an unknown cause. This disease can be caused by maternal age, abortion, uterine myoma, high body mass index, high baby weight, male fetus, maternal tobacco use, and a history of previous caesarean section (Cahill, Robinson, Pettigrew, Galvin, & Stanley, 2018)). Placental adhesions are an additional cause of bleeding within pregnant women. This abnormal invasion of the placenta into the uterine wall is referred to accreta, percreta, or increta depending on the degree of the myometrial invasion (Nankali et al., 2021). Placental accreta spectrum appears in the third trimester of pregnancy with prevalence between 0.3 and 2%, and this condition is very risk with approximately 90% of affected patients need blood transfusions (Loong Tan et al., nd). A huge demand of needs for a caesarean sections in countries all over the world has led to more cases of placental adhesion (Yu et al., 2020).

Surgical methods are necessary to restore placental homeostasis. One example of this technique is ligation of the uterine arteries, the use of floseal, uterine compression sutures with or without intrauterine balloon tamponade, and various placements of hemostatic sutures in the placental bed. (Cahill et al., 2018; Yu et al., 2020). Hysterectomy mostly performed to save patient's life if other surgical methods to stop bleeding have not worked (Chen et al., 2019). However, surgical treatment is often made more difficult due to extensive bleeding. As a result, taking preventative steps to reduce the amount of bleeding can be beneficial (Cahill et al., 2018a). Placement of an internal iliac artery catheter before surgical procedures involving intraoperative arterial balloon occlusion has become a commonly performed preventive procedure (Zhou et al., 2021).

Although a deflated intra-arterial balloon does not completely block blood flow to the uterus, however deflated intra-arterial balloon lowers the blood pressure in the area of obstruction. Hemostatic methods can be more efficient if the amount of bleeding were reduced (Cali et al., 2014). Obstructive balloon occlusion was first described by Dubois et al. and has since then has produced varying results for patients with adhesions, making it a controversial procedure. However, this method has advantages, such as reduced bleeding during surgery to achieve hysterectomy or homeostasis (Peng et al., 2020).

The main aim of this study is to determine how effective using balloon occlusion is to prevent bleeding in patients with PP. Researchers also want to know how well this method can provide additional time for patients to have a precise treatment. Researchers are also trying to find variables that can predict the success or failure of this procedure. Current research tends to focus on the temporary effects without considering the long-term consequences or complications that may arise after the procedure. Additionally, researchers will see if there is a direct comparison between balloon occlusion and other methods of treating PP, such as blood transfusions or surgical procedures (Bantoyot, 2023). This study hopes for a deeper understanding of how balloon occlusion functions to treat PP in both the short and long term. It is hoped that this research will provide stronger scientific evidence to assist clinical decisions in choosing the best treatment for patients with this condition. and other methods of treating PP, such as blood transfusions or surgical procedures . Therefore, it is hoped that this study will improve care and outcomes for patients with PP.

Balloon occlusion, also known as balloon embolization, was first used in the medical field in 1964 by Dr. Charles Dotter to treat peripheral artery disease. This technique was then applied in the field of obstetrics and gynaecology to treat potentially life-threatening pregnancy complications, such as PP. In the 1980s, balloon occlusion began to be used in the treatment of Placenta Previa Accreta (PPA). The main reason for its use is to reduce significant bleeding during caesarean operations and reduce the need for blood transfusions (Chen et al., 2020).

The mechanism of action of balloon occlusion is to stop blood flow to the targeted area. The balloon is placed in the artery that supplies blood to the area to be occluded, such as the internal iliac artery in cases of PP (Peng et al., 2020). Once the balloon is placed, it is inflated with a fluid such as saline to fill the space

inside the artery and compress the artery wall, thereby stopping blood flow through the artery. This reduces significant bleeding during surgical procedures and allows doctors to perform necessary medical procedures more safely and effectively (Chen et al., 2020).

Indications for use of balloon occlusion include medical conditions such as PP and peripheral arterial disease. Balloon occlusion is used in PP cases to reduce significant bleeding during caesarean section and reduce the need for blood transfusions. In peripheral artery disease, balloon occlusion is used to stop blood flow to the affected area to treat the condition (Zhou, Yang, Qiao, & Xiang, 2021). However, there are several contraindications to the use of balloon occlusion. These contraindications include allergies to the balloon material or the fluid used to fill the balloon, active infection in the area to be occluded, significant blood clotting disorders, arterial disease such as an aneurysm or arterial dissection that does not allow the use of a balloon, as well as pregnancy in the case of PPA if there is a risk to the mother or fetus is considered too tall to perform balloon occlusion (Zhang et al., 2019).

RESEARCH METHODS

The methodology employed in crafting this scholarly article encompasses a comprehensive literature review conducted through systematic exploration of diverse online databases and search engines. The primary online database utilized in this study was PubMed, complemented by the incorporation of prominent search engines, namely Google and Google Scholar. The search strategy involved the utilization of targeted keywords, specifically "Placenta Previa" and "Balloon Occlusion Therapy." The literature selected for inclusion in this paper spans the publication period from 2013 to 2023, with a meticulous focus on relevance to the subject matter under scrutiny.

EVALUATION OF THE EFFECTIVENESS OF BALLOON OCCLUSION THERAPY

No	Author (Year)	Type Placenta	Title	Method Study	Results Study
1.	(Chen et al., 2020)	Previa, Accreta	Internal Iliac Artery Balloon Occlusion for Placenta Previa and Suspected Placenta Accreta	Randomized Controlled Trial	Ineffective
2.	(Loong Tan et al., nd)	Accreta	Prophylactic bilateral internal iliac artery balloon occlusion in the management of placenta accreta: A 36-month review	Retrospective Observational	Effective
3.	(Zhou et al., 2021)	Previa, Accreta	The effectiveness of prophylactic internal iliac artery balloon occlusion in the treatment of patients with pernicious	Retrospective Study	Effective

		placenta previa coexisting with placenta accreta			
4.	(Yu et al., 2020)	Previa	Perioperative prophylactic internal iliac artery balloon occlusion in the prevention of postpartum hemorrhage in placenta previa: a randomized controlled trial	Randomized Controlled Trial	Ineffective
5.	(Xu & Zhu, 2022)	Previa	Combined Efficacy of Balloon Occlusion and Uterine Artery Embolization on Coagulation Function in Patients with High-Risk Placenta Previa during Caesarean Section	Randomized Controlled Trial	Effective
6.	(Huo et al., 2021)	Previa	Prophylactic temporary abdominal aortic balloon occlusion for patients with pernicious placenta previa: a retrospective study	Retrospective Study	Effective
7.	(Zhang et al., 2022)	Previa	Analysis of the Risk Factors for Massive Hemorrhage in Pernicious Placenta Previa and Evaluation of the Efficacy of Internal Iliac	Retrospective Study	Effective

Artery Balloon Occlusion					
8.	(Bae et al., 2022)	Previa	The Feasibility and Safety of Temporary Transcatheter Balloon Occlusion of Bilateral Internal Iliac Arteries during Cesarean Section in a Hybrid Operating Room for Placenta Previa with a High Risk of Massive Hemorrhage	Retrospective Study	Effective

RESULTS AND DISCUSSION

Regardless of the use, balloon occlusion still have a possibility of side effects and complications. Some side effects can occur including arterial injury, infection, uncontrolled bleeding, ischemia, allergic reactions, and catheter complications. Balloon insertion and filling can cause injury to the artery, such as perforation or arterial dissection. The use of a catheter can also increase the risk of infection if it isn't conducted with a good aseptic technique. Although balloon occlusion aims to reduce bleeding, there is still a possibility of uncontrolled bleeding or increased bleeding after balloon removal (Dagotto, Yu, & Barouch, 2020) . Balloon occlusion can also cause ischemia or lack of blood supply to the occluded area, which can cause damage to tissues or organs that depend on the interrupted blood flow. Some individuals may experience an allergic reaction to the balloon material or the fluid that's used to fill the balloon. Additionally, using a catheter to insert the balloon can cause complications such as bleeding, infection, or catheter obstruction (Chen, Zhou, & Wang, 2020).

Conservative therapy in PP involves close monitoring and preventive measures to reduce the risk of potentially fatal bleeding. Patients with PP are often advised to undergo complete bed rest and avoid strenuous physical activity. They'll also be closely monitored by medical personnel to monitor the development of PP's condition and ensure there are no signs of dangerous bleeding. If significant bleeding occurs, the patient may require a blood transfusion to replace the lost blood volume. In addition, preparation for emergency delivery via caesarean section may be necessary if heavy bleeding or signs of fetal distress occur.

Conservative therapy and surgical intervention can be used to treat bleeding in PP. Conservative therapy includes medical management and close observation, whereas surgical intervention involves measures such as uterine artery embolization, ovarian artery embolization, and hysterectomy (Nankali et al., 2021). Study conducted by (Huo et al., 2021) stated that conservative therapy and surgical intervention can be used to treat bleeding in PP. Conservative therapy involves medical management and close observation, whereas surgical intervention involves measures such as uterine artery embolization, ovarian artery embolization, and hysterectomy. However, surgical therapy also has some disadvantages. The risk of surgical complications, such as excessive bleeding, infection, organ damage, and risk of surgical failure, may occur. In addition, surgical therapy in PP can also have an impact on future pregnancies. Some surgical

procedures, such as hysterectomy, can result in the inability to get pregnant or maintain a pregnancy in the future (Zhang et al., 2019).

The application of balloon occlusion therapy should also be considered carefully, taking into several important factors. Balloon occlusion is commonly used in cases of PP. Therefore, accurate diagnosis and careful assessment of the placental invasion degree are necessary. Installation and the use of a balloon occlusion requires sufficient skill and experience. This procedure must be performed by trained and experienced medical personnel to minimize the risk of complications. Balloon occlusion can help reduce bleeding during surgery, but other bleeding management strategies need to be considered, such as blood transfusions, use of hemostatic drugs, and additional surgical procedures that may be needed. The benefits and risks of using balloon occlusion must be thoroughly evaluated. Although balloon occlusion can help reduce bleeding, there is also a risk of complications such as arterial injury, infection, and ischemia. The expected benefits must be commensurate with the possible risks. Patients should be given clear and comprehensive information about balloon occlusion procedures, including benefits, risks, and alternatives. The decision to use balloon occlusion should involve the patient in the decision-making process and be based on informed and voluntary consent.

CONCLUSION

Studies have shown that Balloon Occlusion Therapy has proven effective in stopping PP bleeding by compressing the bleeding area in the uterus, reducing excessive blood flow, and reducing the need for blood transfusions. Additionally, this therapy may be a beneficial option for patients who are not eligible for surgery, as it reduces the risk of serious complications associated with emergency surgical procedures. However, further research is needed to more widely validate its effectiveness, discover variables that influence the results, and evaluate the benefits and risks of Balloon Occlusion Therapy in future research should be carried out on a larger scale with a strong research strategy, such as a randomized controlled clinical trial. This will help generate stronger evidence about the effectiveness and safety of balloon occlusion and future research will need to focus on the mechanism of action of balloon occlusion. By understanding the mechanisms of action in more depth, more effective approaches to the use of balloon occlusion can be developed.

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